

Toxicological Assessment of ISS Air Quality: April – May 2013 (Increment 35)



A summary of the analytical results from 4 mini-grab sample containers (mGSCs) collected on ISS and returned aboard 33S is shown in Table 1. Due to the launch delay of the ATV4 resupply mission, monthly samples were reduced in April and May by omitting sampling of the Service Module in order to ensure contingency samplers were available if needed. Complete data tables of all measured concentrations and corresponding T-values based on 180-day SMACs are enclosed. The detection limit for all target compounds, except m/p-xylenes and hexachloro-1,3-butadiene was 0.025 mg/m³. The detection limit for m/p-xylenes and hexachloro-1,3-butadiene and all non-target compounds was 0.05 mg/m³. The average recoveries of the 3 surrogate standards from the mGSCs were as follows: ¹³C-acetone, 116 ± 12%; ⁵D-fluorobenzene, 117 ± 7%; and ⁵D-chlorobenzene, 111 ± 15%. Initial measured sample pressures were between 13.9 and 14.1 psia for all samples, indicating nominal sample collection.

A summary of the analytical results from 3 pairs of passive-diffusion formaldehyde badges collected on ISS and returned aboard 33S is also provided in Table 1. In an effort to conserve samples due to the delay of the ATV4 resupply mission, FMK sampling was only conducted in the US Lab in May. Positive control recoveries (1 trip and 2 lab controls) were 79%, 87%, and 116%, respectively.

Table 1. Analytical Summary of ISS results

Sample Location	Sample Date	NMVOCs ^a (mg/m ³)	Freon 218 (mg/m ³)	Alcohols (mg/m ³)	T Value ^b (units)	CO ₂ (mg/m ³)	Formaldehyde (µg/m ³)
Lab	4/1/2013	9.9	19	6.2	0.39	7400	41
JPM	4/1/2013	11	20	6.4	0.46	7300	--
SM ^c	4/1/2013	--	--	--	--	--	36
Lab	5/6/2013	8.9	18	5.3	0.39	7600	40
Col	5/6/2013	10	18	5.3	0.53	8200	--
<i>Guideline</i>		<25	---	<5	<1	<9300	<120

^a Non-methane volatile organic hydrocarbons, excluding Freon 218

^b Based on 180-d SMACs and calculated excluding CO₂ and formaldehyde

^c No samples were collected in the SM during this time period in an effort to conserve contingency mGSCs

Toxicological Evaluation of ISS Air Quality: Routine monthly sampling provides a very limited set of samples on which to perform an air quality assessment. However, based on these samples, there is no concern for crew health. Slightly elevated alcohol values were reported, with ethanol being the primary contributor. The alcohol guideline (<5 mg/m³) is intended to protect the water recovery system from risk of overloading, and reported values are not a concern for crew health. The primary contributors to the total T-value across all sampling locations throughout this time period were the cyclic siloxanes, hexamethylcyclotrisiloxane and

decamethylcyclopentasiloxane. These compounds were measured below levels of health concern; however, they may contribute to periodic accumulation of siloxanes in the water recovery system. GSCs provide only a snapshot of conditions and are not ideal for evaluating potential CO₂ exposures. However, reported levels were below 4 mmHg (9300 mg/m³), as requested for this Increment in Chit 11188.

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Enclosures Table 1: Analytical concentrations of compounds found in the 33S mGSCs
 Table 2: T-values corresponding to analytical concentrations in Table 1, based on
 180-day SMACs.